

(19)



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

**EP 0 667 349 B1**

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention  
of the grant of the patent:

24.01.2001 Bulletin 2001/04

(21) Application number: 94925620.0

(22) Date of filing: 02.09.1994

(51) Int Cl.7: C07D 487/04, A61K 31/53

(86) International application number:  
PCT/JP94/01455

(87) International publication number:  
WO 95/07282 (16.03.1995 Gazette 1995/12)

(54) **DEPRESSION REMEDY**

ANTIDEPRESSIVA

ANTIDEPRESSEUR

(84) Designated Contracting States:  
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL  
PT SE

(30) Priority: 06.09.1993 JP 22143193

(43) Date of publication of application:  
16.08.1995 Bulletin 1995/33

(73) Proprietor: KYOWA HAKKO KOGYO KABUSHIKI  
KAISHA  
Chiyoda-ku, Tokyo 100 (JP)

(72) Inventors:

- SUZUKI, Fumio  
Shizuoka 411 (JP)
- KOIKE, Nobuaki  
Shizuoka 411 (JP)
- SHIMADA, Junichi  
Belmont, MA 02178 (US)
- KITAMURA, Shigeto  
Tokyo 194 (JP)
- ICHIKAWA, Shunji  
Shizuoka 419-01 (JP)
- NAKAMURA, Joji  
Shizuoka 411 (JP)
- SHIOZAKI, Shizuo  
Shizuoka 411 (JP)

(74) Representative: VOSSIUS & PARTNER  
Siebertstrasse 4  
81675 München (DE)

(56) References cited:

EP-A- 0 379 979	EP-A- 0 459 702
EP-A- 0 515 107	EP-A- 0 552 712
JP-A- 5 097 855	JP-A- 5 155 887

- WILLIAMS, M.: "Purinergic Drugs: Opportunities in the 1990s", DRUG DEVELOPMENT RESEARCH, , 1993, vol. 28, no. 3, pages 438 to 444
- SARGES, R. ET.AL.: "4-Amino[1,2,4]triazolo[4,3-a]quinoxalines", JOURNAL OF MEDICINAL CHEMISTRY, , 1990, vol. 33, no. 8, pages 2240 to 2254
- JIANG, H. ET.AL.: "Potentiation of Antiparkinson Effects of Dopamine Agonists ...", NEUROLOGY, , 1993, vol. 43(SUP2), no. 4, pages A154 to
- JIANG, H. ET.AL.: "Adenosine receptor antagonists potentiate dopamine ...", BRAIN RESEARCH, , 1993, vol. 613, no. 2, pages 347 to 351
- FRANCIS, J.E. ET.AL.: "Structure-Activity profile of a series of novel Triazoloquinazoline Adenosine Antagonists", JOURNAL OF MEDICINAL CHEMISTRY, , 1988, vol. 31, no. 5, pages 1014 to 1020
- TRIVEDI, B.K. ET.AL.: "[1,2,4]Triazolo[4,3-a]quinoxalin-4-amines: A new class ...", JOURNAL OF MEDICINAL CHEMISTRY, , 1988, vol. 31, no. 5, pages 1011 to 1014
- KANDA, T. ET.AL.: "Adenosine A2A Antagonist: A novel Antiparkinsonian Agent ...", ANNALS OF NEUROLOGY, , , vol. 43, no. 4, pages 507 to 513

### Remarks:

The file contains technical information submitted after the application was filed and not included in this specification

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

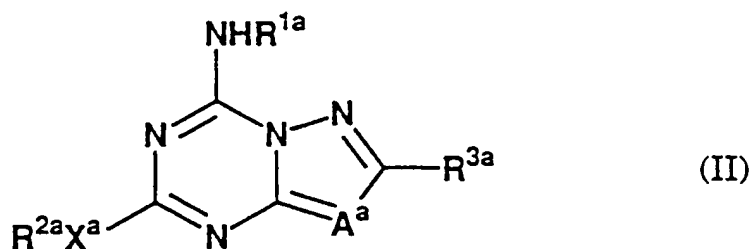
Best Available Copy

EP 0 667 349 B1

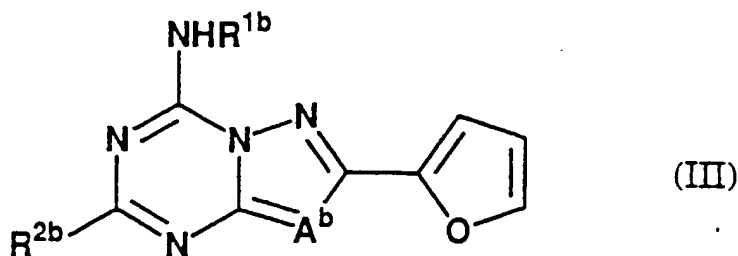
## Description

[0001] The present invention relates to an antidepressant.

[0002] It is known that compounds represented by the following formula (II):



in which R<sup>1a</sup> represents hydrogen, substituted or unsubstituted lower alkyl, or lower alkanoyl, R<sup>2a</sup> represents hydrogen, lower alkenyl, substituted or unsubstituted cycloalkyl, substituted or unsubstituted phenyl, substituted or unsubstituted aralkyl, or a substituted or unsubstituted heterocyclic group, R<sup>3a</sup> represents a substituted or unsubstituted 5-membered heterocyclic group, X<sup>a</sup> represents O, S, S(O), S(O)<sub>2</sub>, or NR<sup>4a</sup> (in which R<sup>4a</sup> represents hydrogen, or substituted or unsubstituted lower alkyl, or R<sup>2a</sup> and NR<sup>4a</sup> are combined to form a substituted or unsubstituted 4 to 6-membered saturated heterocyclic group), and A<sup>a</sup> represents N or CR<sup>5a</sup> (in which R<sup>5a</sup> represents hydrogen, or substituted or unsubstituted lower alkyl), and compounds represented by the following formula (III):



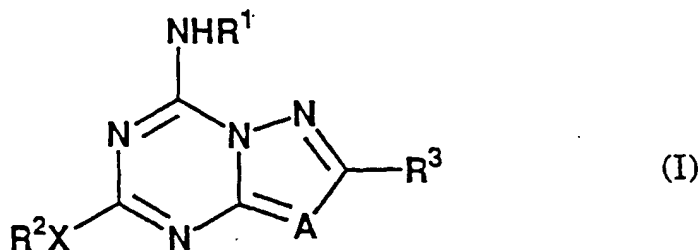
in which R<sup>1b</sup> represents hydrogen, substituted or unsubstituted lower alkyl, or lower alkanoyl, R<sup>2b</sup> represents substituted or unsubstituted lower alkyl, lower alkenyl, lower alkynyl, substituted or unsubstituted phenyl, or a substituted or unsubstituted 5- or 6-membered heterocyclic group, and A<sup>b</sup> represents N or CR<sup>5b</sup> (in which R<sup>5b</sup> represents hydrogen, or substituted or unsubstituted lower alkyl), have a selective adenosine A<sub>2</sub> antagonistic activity (Japanese Published Unexamined Patent Application Nos. 97855/93 and 155887/93).

[0003] It is clinically well known that the conventional antidepressant exhibits little effect in a single administration, and the effect is observed after at least about two weeks' consecutive administration.

[0004] With the conventional antidepressant, the enhancement of clonidine-induced aggressive behavior in mice is observed after at least ten days' consecutive administration [J. Neural Transmission, 52, 189 (1981)].

#### Disclosure of the Invention

[0005] The present invention relates to the use of a triazine derivative, or a pharmaceutically acceptable salt thereof, the derivative being represented by the following Formula (I):



in which, R<sup>1</sup> represents hydrogen, substituted or unsubstituted lower alkyl, or substituted or unsubstituted lower alkanoyl; R<sup>2</sup> represents hydrogen, substituted or unsubstituted lower alkyl, substituted or unsubstituted lower alkenyl, substituted or unsubstituted cycloalkyl, substituted or unsubstituted aryl, substituted or unsubstituted aralkyl, or a substituted or unsubstituted heterocyclic group; R<sup>3</sup> represents a substituted or unsubstituted heterocyclic group; X represents a single bond, O, S, S(O), S(O)<sub>2</sub>, or NR<sup>4</sup> (in which R<sup>4</sup> represents hydrogen, or substituted or unsubstituted lower alkyl; or R<sup>2</sup> and NR<sup>4</sup> are combined to form a substituted or unsubstituted 4 to 6-membered saturated heterocyclic group); and A represents N for the preparation of a pharmaceutical composition which is useful for treating depression.

[0006] Furthermore, the present invention allows the provision of a composition for treating depression comprising, in a pharmaceutically acceptable dosage form, an effective amount of a triazine derivative represented by the above formula (I) or a pharmaceutically acceptable salt thereof in association with a pharmaceutically acceptable carrier.

[0007] The compounds represented by Formula (I) are hereinafter referred to as Compound (I).

[0008] In the definitions of the groups in Formula (I), the lower alkyl means a straight-chain or branched alkyl group having 1 to 6 carbon atoms such as methyl, ethyl, propyl, isopropyl, butyl, isobutyl, sec-butyl, tert-butyl, pentyl, neopentyl, and hexyl. The lower alkanoyl means a straight-chain or branched alkanoyl group having 1 to 7 carbon atoms such as formyl, acetyl, propionyl, butyryl, isobutyryl, pivaloyl, and hexanoyl. The lower alkenyl means a straight-chain or branched alkenyl group having 2 to 6 carbon atoms such as vinyl, 1-methylvinyl, 1-propenyl, 2-propenyl, 1-butenyl, 2-methyl-1-propenyl, 1,3-butadienyl, 1-pentenyl, 4-pentenyl, 1-hexenyl, 1,4-hexadienyl, and 5-hexenyl. The cycloalkyl means a cycloalkyl group having 3 to 8 carbon atoms such as cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, and cyclooctyl, a bicycloalkyl group having 7 to 12 carbon atoms such as norbornyl, or a tricycloalkyl group having 7 to 12 carbon atoms. Examples of the aryl are phenyl, naphthyl, indenyl, and anthryl. The aralkyl means an aralkyl group having 7 to 15 carbon atoms such as benzyl, 1-phenylethyl, 2-phenylethyl, 2-phenylpropyl, and diphenylmethyl. Examples of the heterocyclic group are furyl, thienyl, pyrrolyl, pyranlyl, thiopyranlyl, pyridyl, oxazolyl, thiazolyl, imidazolyl, pyrimidyl, triazinyl, indolyl, quinolyl, purinyl, benzoxazolyl, benzothiazolyl, and benzimidazolyl. Examples of the 4 to 6-membered saturated heterocyclic group are azetidino, pyrrolidino, morpholino, and thiomorpholino.

[0009] The substituted lower alkyl, the substituted lower alkanoyl, the substituted lower alkenyl, the substituted cycloalkyl, the substituted aryl, the substituted aralkyl, the substituted heterocyclic group, and the substituted 4 to 6-membered saturated heterocyclic group each have 1 to 3 independently-selected substituents. Examples of the substituents are lower alkyl, hydroxy, hydroxy-lower alkyl, halogeno-lower alkyl, lower alkoxy, lower alkoxy-carbonyl, lower alkylthio, lower alkylsulfanyl, lower alkylsulfonyl, aryloxy, aralkyloxy, halogeno-aryloxy, halogeno-aralkyloxy, carboxy, carbamoyl, lower alkanoyl, aroyl, aryl, halogen, nitro, amino, cyano, and trifluoromethyl. The lower alkyl and the lower alkyl moiety of the hydroxy-lower alkyl, the halogeno-lower alkyl, the lower alkoxy, the lower alkoxy-carbonyl, the lower alkylthio, the lower alkylsulfanyl, and the lower alkylsulfonyl have the same meaning as the lower alkyl defined above. The aryl and the aryl moiety of the aryloxy, the halogeno-aryloxy, and the aroyl have the same meaning as the aryl defined above. The aralkyl moiety of the aralkyloxy and the halogeno-aralkyloxy have the same meaning as the aralkyl defined above. The lower alkanoyl has the same meaning as the lower alkanoyl defined above. The halogen and the halogen moiety of the halogeno-lower alkyl, the halogeno-aryloxy, and the halogeno-aralkyloxy include fluorine, chlorine, bromine, and iodine.

[0010] The above-mentioned pharmaceutically acceptable salts of Compounds (I) include pharmaceutically acceptable acid addition salts, metal salts, ammonium salts, organic amine addition salts, and amino acid addition salts.

[0011] Examples of the pharmaceutically acceptable acid addition salts of Compounds (I) are inorganic acid addition salts such as hydrochloride, sulfate, and phosphate, and organic acid addition salts such as acetate, maleate, fumarate, tartrate, and citrate. Examples of the pharmaceutically acceptable metal salts are alkali metal salts such as sodium salt and potassium salt, alkaline earth metal salts such as magnesium salt and calcium salt, aluminium salt, and zinc salt. Examples of the pharmaceutically acceptable ammonium salts are ammonium salt and tetramethyl ammonium salt. Examples of the pharmaceutically acceptable organic amine addition salts are salts with morpholine and piperidine. Examples of the pharmaceutically acceptable amino acid addition salts are salts with lysine, glycine, and phenylalanine.

[0012] Compounds (I) can be produced according to the methods disclosed in the above-described literatures or

similar methods thereto.

**[0013]** The desired compounds in the processes can be isolated and purified by purification methods conventionally used in organic synthetic chemistry, for example, filtration, extraction, washing, drying, concentration, recrystallization, and various kinds of chromatography.

5 **[0014]** In the case where a salt of Compound (I) is desired and it is produced in the form of the desired salt, it can be subjected to purification as such. In the case where Compound (I) is produced in the free state and its salt is desired, Compound (I) is dissolved or suspended in a suitable solvent, followed by addition of an acid or a base to form a salt.

**[0015]** Compounds (I) and pharmaceutically acceptable salts thereof may be in the form of adducts with water or various solvents, which can also be used as the therapeutic agents of the present invention.

10 **[0016]** Some of Compounds (I) can exist in the form of stereoisomers and optical isomers, and all possible stereoisomers, optical isomers, and mixtures thereof can also be used as the therapeutic agents of the present invention.

**[0017]** Examples of Compound (I) are shown in Table 1.

15

20

25

30

35

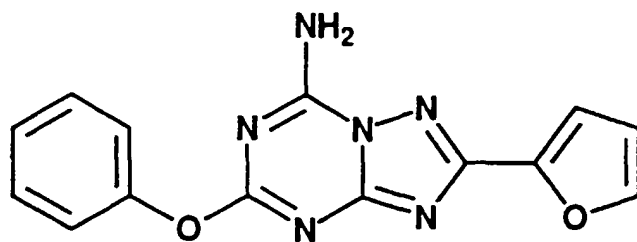
40

45

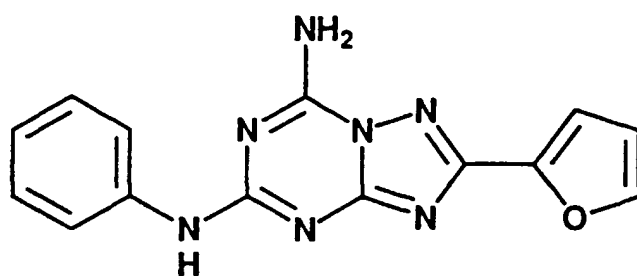
50

55

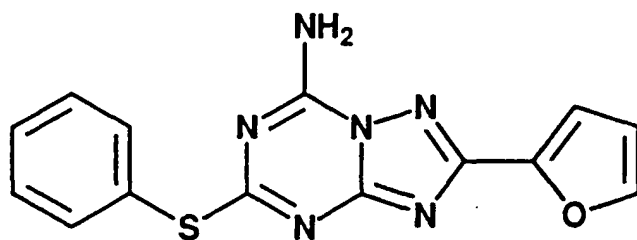
Table 1



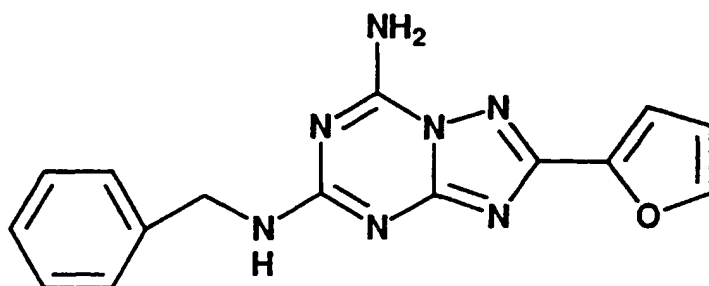
(Compound 1)



(Compound 2)



(Compound 3)



(Compound 4)

**Compound 1:** 7-Amino-2-(2-furyl)-5-phenoxy[1,2,4]triazolo-[1,5-a]-1,3,5-triazine (compound disclosed in Example 1 of Japanese Published Unexamined Patent Application No. 97855/93)  
Melting Point: 250.7-251.7°C

Elemental Analysis: C <sub>14</sub> H <sub>10</sub> N <sub>6</sub> O <sub>2</sub>			
Calcd. (%)	C, 57.14;	H, 3.43;	N, 28.56
Found (%)	C, 56.89;	H, 3.36;	N, 28.35

NMR (DMSO-d<sub>6</sub>) δ (ppm): 9.00(2H, broad singlett), 7.92(1H, d, J=1.5Hz), 7.49-7.43(2H, m), 7.28-7.23(3H, m), 7.12(1H, d, J=3.0Hz), 6.70(1H, dd, J=1.5, 3.0Hz)

**Compound 2:** 7-Amino-5-anilino-2-(2-furyl)[1,2,4]triazolo-[1,5-a]-1,3,5-triazine (compound disclosed in Example 27 of Japanese Published Unexamined Patent Application No. 97855/93)  
Melting Point: >280°C

Elemental Analysis: C <sub>14</sub> H <sub>11</sub> N <sub>7</sub> O·0.1C <sub>2</sub> H <sub>5</sub> OH			
Calcd. (%)	C, 57.25;	H, 3.92;	N, 32.91
Found (%)	C, 57.01;	H, 3.73;	N, 32.77

NMR (DMSO-d<sub>6</sub>) δ (ppm): 9.68(1H, s), 8.44(2H, broad singlett), 7.90(1H, d, J=1.7Hz), 7.80(2H, d, J=8.3Hz), 7.31(2H, dd, J=7.3, 8.3Hz), 7.12(1H, d, J=3.3Hz), 7.00(1H, t, J=7.3Hz), 6.70(1H, dd, J=1.7, 3.3Hz)

**Compound 3:** 7-Amino-2-(2-furyl)-5-phenylthio[1,2,4]triazolo[1,5-a]-1,3,5-triazine (compound disclosed in Example 2 of Japanese Published Unexamined Patent Application No. 97855/93)  
Melting Point: >280°C

Elemental Analysis: C <sub>14</sub> H <sub>10</sub> N <sub>6</sub> OS·0.1H <sub>2</sub> O			
Calcd. (%)	C, 53.87;	H, 3.29;	N, 26.92
Found (%)	C, 53.76;	H, 3.21;	N, 26.88

NMR (DMSO-d<sub>6</sub>) δ (ppm): 8.94(2H, broad singlett), 7.91(1H, d, J=1.7Hz), 7.64(2H, dd, J=2.0, 5.3Hz), 7.51-7.50(3H, m), 7.12(1H, d, J=3.3Hz), 6.70(1H, dd, J=1.7, 3.3Hz)

**Compound 4:** 7-Amino-5-benzylamino-2-(2-furyl)[1,2,4]triazolo[1,5-a]-1,3,5-triazine (compound disclosed in Example 31 of Japanese Published Unexamined Patent Application No. 97855/93)  
Melting Point: 223.6-225.0°C

Elemental Analysis: C <sub>15</sub> H <sub>13</sub> N <sub>7</sub> O			
Calcd. (%)	C, 58.63;	H, 4.26;	N, 31.90
Found (%)	C, 58.71;	H, 4.19;	N, 32.07

NMR (DMSO-d<sub>6</sub>) δ (ppm): 8.19(2H, broad singlett), 7.97(1H, t, J=5.9Hz), 7.86(1H, d, J=1.7Hz), 7.33-7.22(5H, m), 7.03(1H, d, J=3.3Hz), 6.67(1H, dd, J=1.7, 3.3Hz), 4.50(2H, d, J=5.9Hz)

**[0018]** The pharmacological activities of Compound (I) are shown below by experimental examples.

#### **Experimental Example 1**      Effect on Clonidine-Induced Aggressive Behavior

**[0019]** The effect of a test compound on the aggressive behavior induced by intraperitoneal administration of clonidine was investigated [Eur. J. Pharmacol., 29, 374 (1968)].

**[0020]** The experiment was carried out by using several groups of ddY-strain male mice (weighing 20 to 25 g, Japan SLC), each group consisting of two mice. The test compound was suspended in injectable distilled water (Otsuka Pharmaceutical Co., Ltd.) containing Tween 80 [polyoxyethylene (20) sorbitan monooleate]. Clonidine hydrochloride (Sigma Co.) was dissolved in physiological saline solution (Otsuka Pharmaceutical Co., Ltd.). The test compound

suspension or the suspension containing no test compound (control) was orally administered to separate groups of the mice (0.1 ml per 10 g of body weight). Sixty minutes after the oral administration of the test compound, clonidine hydrochloride (20 mg/kg) was intraperitoneally injected. The number of biting attacks during 30 minutes after clonidine treatment was counted. The effect of the compound was evaluated by comparing the average number of biting attacks of the test compound-administered groups with that of control groups (Statistical comparison : Student's t-test).

[0021] The results are shown in Table 2.

Table 2

Test Compd.	Dose (mg/kg, po)	Number of the Biting Attacks (Counts: mean $\pm$ S.E. M.)		Number of the Attacks of Test Compound-Treated Group/Number of the Attacks of Control Group
		Control Group (number of animals)	Test Compound-Treated Group (number of animals)	
1	10	11.9 $\pm$ 2.60 (15)	48.5 $\pm$ 12.34* (15)	4.1
1	2.5	11.9 $\pm$ 2.60 (15)	55.2 $\pm$ 12.02** (15)	4.6
2	10	1.67 $\pm$ 1.17 (15)	22.40 $\pm$ 8.22* (15)	13.4
3	2.5	2.47 $\pm$ 1.40 (15)	10.73 $\pm$ 2.41** (15)	4.3
4	10	2.40 $\pm$ 1.45 (10)	37.30 $\pm$ 9.90** (10)	15.5

\*: p<0.05;

\*\*: p<0.01

[0022] Compound (I) and pharmaceutically acceptable salts thereof exhibit activity in enhancement of clonidine-induced aggressive behavior, and are useful as an antidepressant.

#### Experimental Example 2 Effect on Reserpine-Induced Hypo-Mobility

[0023] The experiment was carried out by using several groups of ddY-strain male mice (weighing 21 to 30 g, Japan SLC), each group consisting of 8 mice. Reserpine (Apopron injection 1 mg, Daiichi Seiyaku Co., Ltd.) dissolved in injectable distilled water (Otsuka Pharmaceutical Co., Ltd.) was intraperitoneally administered to each mouse at a dose of 5 mg/kg. The test compound was orally administered to separate groups of the mice after 18 to 24 hours of the reserpine administration. The amount of active movements of each mouse was measured by using Automex-II (Columbus Instruments International Corp.) for the period of 30 minutes starting 60 minutes after the administration of the test compound. The effect of the compounds was evaluated by comparing the average counts of the active movements of the test compound-administered groups with those of the control groups. Statistical comparison of the values was carried out by Williams-Wilcoxon test.

[0024] The results are shown in Table 3.

Table 3

Group	Administration	Dose of Test Compound (mg/kg)	Amount of Active Movements (Counts; mean $\pm$ S.E.M)
Normal Control	Reserpine (-)		
Reserpine	Test Compound (-)	-	1558 $\pm$ 186.9
	Reserpine (+)		
Compound 1	Test Compound (-)	-	8 $\pm$ 3.6
	Reserpine (+)		
	Compound 1 (+)	10	493 $\pm$ 111.6 **

\*\*: p<0.01 (comparison with Reserpine-treated group)

Table 3 (continued)

Group	Administration	Dose of Test Compound (mg/kg)	Amount of Active Movements (Counts; mean $\pm$ S.E.M)
Normal Control	Reserpine (-)		
	Test Compound (-)	-	1284 $\pm$ 95.5
Reserpine	Reserpine (+)		
	Test Compound (-)	-	87 $\pm$ 50.9
Compound 2	Reserpine (+)		
	Compound 2 (+)	10	190 $\pm$ 70.0
Compound 3	Reserpine (+)		
	Compound 3 (+)	10	410 $\pm$ 162.2 *
Compound 4	Reserpine (+)		
	Compound 4 (+)	10	470 $\pm$ 79.0 **

\*: p&lt;0.05;

\*\*: p&lt;0.01 (comparison with Reserpine-treated group)

**Experimental Example 3** Forced Swimming Test (Measurement of Immobility Time)

[0025] The experiment was carried out by using several groups of ddY-strain male mice (weighing 21 to 26 g, Japan SLC), each group consisting of 10 mice. The animals were housed in the animal quarters with free access to food and water until experimental use. Meanwhile, room temperature and relative humidity were kept at  $23 \pm 1^\circ\text{C}$  and  $55 \pm 5\%$ , respectively. The animals showing an abnormal response in spontaneous activity, muscle tone, and visual placing were excluded in advance. Test compounds were suspended in 0.3% Tween 80 and orally administered to the animals one hour prior to the test. Only 0.3% Tween 80 at 10 mg/kg were orally administered to control groups. The measurement of immobility time was carried out according to the procedure of Porsolt et al. [(Arch. int. Pharmacodyn. Ther., 229, 327 (1977)]. The mouse was kept swimming for 6 minutes in a cylindrical tank made of transparent acrylic resin (diameter: 10 cm; height: 25 cm) containing 9 cm of water at  $23 \pm 1^\circ\text{C}$ . Although the mouse swims and struggles for escaping from the tank immediately after entering the tank, its movement gradually decreases in one or two minutes. The measurement of immobility time was carried out by counting, by seconds, the time during which the mouse did not make any attempt to escape (immobility time: behavioral despair) for the last 4 minutes (240 seconds). For the first 2 minutes, immobility time was not measured. In order to reduce an influence of a circadian rhythm on the animals, 5 mice of each group were tested in the morning, and another 5 mice of each group were tested in the afternoon. The measurement of immobility time was carried out simultaneously with two animals and by blind test to observers as to the presence or absence of the test compound and the distinction in the amount of the test compound. Statistical analysis of the results was carried out with a one-way analysis of variance by Steel-test for comparisons between the control group treated with only a solvent and the test compound-treated group.

[0026] The results are shown in Table 4.

Table 4

Test Compd.	Dose (mg/kg, po)	Immobility Time (Seconds: mean $\pm$ S.E.M.)	
		Control Group (number of animals)	Test Compound-Treated Group (number of animals)
1	2.5	125.2 $\pm$ 17.7 (10)	66.1 $\pm$ 15.4 (10)
2	2.5	152.7 $\pm$ 16.0 (10)	88.6 $\pm$ 22.5 (10)

**Experimental Example 4** Acute Toxicity Test

[0027] Test compounds were orally administered to groups of dd-strain male mice weighing  $20 \pm 1$  g, each group consisting of three mice. Seven days after the administration, minimum lethal dose (MLD) of each compound was determined by observing the mortality.

[0028] The MLD value of Compound 1 is greater than 300 mg/kg, indicating that the toxicity of the compound is weak. Therefore, the compound can be safely used in a wide range of doses.



[0029] Compound (I) and pharmaceutically acceptable salts thereof can be administered as they are, or in the form of various pharmaceutical compositions. The pharmaceutical compositions in accordance with the present invention can be prepared by uniformly mixing an effective amount of Compound (I) or a pharmaceutically acceptable salt thereof, as an active ingredient, with a pharmaceutically acceptable carrier. It is desired that such pharmaceutical compositions

[0030] For preparing a pharmaceutical composition for oral administration, any useful pharmaceutically acceptable carrier can be used. For example, liquid preparations for oral administration such as suspension and syrup can be prepared using water, sugars such as sucrose, sorbitol, and fructose, glycols such as polyethylene glycol and propylene glycol, oils such as sesame oil, olive oil, and soybean oil, preservatives such as p-hydroxybenzoates, flavors such as strawberry flavor and peppermint, and the like. Powders, pills, capsules, and tablets can be prepared using excipients such as lactose, glucose, sucrose, and mannitol, disintegrating agents such as starch and sodium alginate, lubricants such as magnesium stearate and talc, binders such as polyvinyl alcohol, hydroxypropyl cellulose, and gelatin, surfactants such as fatty acid esters, plasticizers such as glycerin, and the like. Tablets and capsules are the most useful oral unit dose forms because of the readiness of administration. For preparing tablets and capsules, solid pharmaceutical carriers are used.

[0031] Injectable preparations can be prepared using a carrier such as distilled water, a salt solution, a glucose solution, or a mixture of a salt solution and a glucose solution. The preparations can be prepared in the form of solution, suspension or dispersion according to a conventional method by using a suitable solubilizing auxiliary or suspending agent.

[0032] Compound (I) and pharmaceutically acceptable salts thereof can be administered orally or parenterally as injections in the said dosage forms. The effective dose and the administration schedule vary depending upon the mode of administration, the age, body weight, and conditions of a patient, etc. However, generally, Compound (I) or a pharmaceutically acceptable salt thereof is administered in a daily dose of 1 to 50 mg/kg in 3 to 4 parts.

[0033] Certain embodiments of the invention are illustrated in the following examples.

#### Example 1      Tablets

[0034] Tablets having the following composition were prepared in a conventional manner.

[0035] Compound 1 (40 g) was mixed with 286.8 g of lactose and 60 g of potato starch, followed by addition of 120 g of a 10% aqueous solution of hydroxypropylcellulose. The resultant mixture was kneaded, granulated, and then dried by a conventional method. The granules were refined to give granules used to make tablets. After mixing the granules with 1.2 g of magnesium stearate, the mixture was formed into tablets each containing 20 mg of the active ingredient by using a tablet maker (Model RT-15, Kikusui) having pestles of 8 mm diameter.

Composition of One Tablet	
Compound 1	20 mg
Lactose	143.4mg
Potato Starch	30 mg
Hydroxypropylcellulose	6 mg
Magnesium Stearate	0.6mg
	200 mg

#### Example 2      Fine Granules

[0036] Fine granules having the following composition were prepared in a conventional manner.

[0037] Compound 1 (20 g) was mixed with 655 g of lactose and 285 g of corn starch, followed by addition of 400 g of a 10% aqueous solution of hydroxypropylcellulose. The resultant mixture was kneaded, granulated, and then dried by a conventional method to give fine granules containing 20 g of the active ingredient in 1,000 g.

Composition of One Pack of Fine Granules	
Compound 1	20 mg
Lactose	655 mg
Corn Starch	285 mg
Hydroxypropylcellulose	40 mg
	1,000 mg

**Example 3** Capsules

[0038] Capsules having the following composition were prepared in a conventional manner.

[0039] Compound 1 (200 g) was mixed with 995 g of Avicel and 5 g of magnesium stearate. The mixture was put in hard capsules No. 4 each having a capacity of 120 mg by using a capsule filler (Model LZ-64, Zanashi) to give capsules each containing 20 mg of the active ingredient.

Composition of One Capsule	
Compound 1	20 mg
Avicel	99.5mg
Magnesium Stearate	0.5mg
	120 mg

**Example 4** Injections

[0040] Injections having the following composition were prepared in a conventional manner.

[0041] Compound 1 (1 g) was dissolved in 100 g of purified soybean oil, followed by addition of 12 g of purified egg yolk lecithin and 25 g of glycerine for injection. The resultant mixture was made up to 1,000 ml with distilled water for injection, thoroughly mixed, and emulsified by a conventional method. The resultant dispersion was subjected to aseptic filtration by using 0.2  $\mu$ m disposable membrane filters, and then aseptically put into glass vials in 2 ml portions to give injections containing 2 mg of the active ingredient per vial.

Composition of One Injection Vial	
Compound 1	2 mg
Purified Soybean Oil	200 mg
Purified Egg Yolk Lecithin	24 mg
Glycerine for Injection	50 mg
Distilled Water for Injection	1.72 ml
	2.00 ml

**Example 5** Tablets

[0042] Tablets having the following composition were prepared in a conventional manner.

[0043] Compound 2 (40 g) was mixed with 286.8 g of lactose and 60 g of potato starch, followed by addition of 120 g of a 10% aqueous solution of hydroxypropylcellulose. The resultant mixture was kneaded, granulated, and then dried by a conventional method. The granules were refined to give granules used to make tablets. After mixing the granules with 1.2 g of magnesium stearate, the mixture was formed into tablets each containing 20 mg of the active ingredient by using a tablet maker (Model RT-15, Kikusui) having pestles of 8 mm diameter.

Composition of One Tablet	
Compound 2	20 mg
Lactose	143.4mg
Potato Starch	30 mg
Hydroxypropylcellulose	6 mg
Magnesium Stearate	0.6mg
	200 mg

**Example 6** Tablets

[0044] Tablets having the following composition were prepared in a conventional manner.

[0045] Compound 3 (40 g) was mixed with 286.8 g of lactose and 60 g of potato starch, followed by addition of 120 g of a 10% aqueous solution of hydroxypropylcellulose. The resultant mixture was kneaded, granulated, and then dried by a conventional method. The granules were refined to give granules used to make tablets. After mixing the granules

with 1.2 g of magnesium stearate, the mixture was formed into tablets each containing 20 mg of the active ingredient by using a tablet maker (Model RT-15, Kikusui) having pestles of 8 mm diameter.

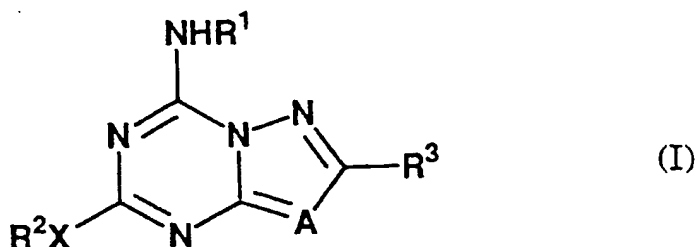
Composition of One Tablet	
Compound 3	20 mg
Lactose	143.4mg
Potato Starch	30 mg
Hydroxypropylcellulose	6 mg
Magnesium Stearate	0.6mg
	200 mg

#### Industrial Applicability

[0046] According to the present invention, there can be provided an excellent antidepressant.

#### Claims

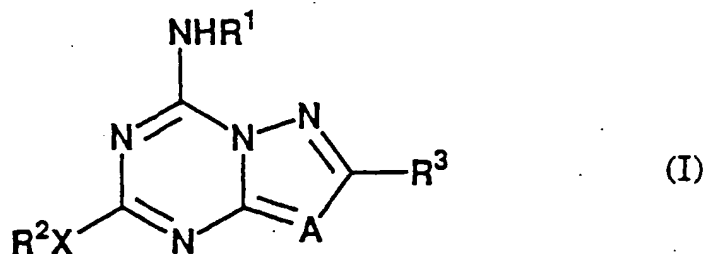
1. The use of a triazine derivative or a pharmaceutically acceptable salt thereof, represented by the following Formula (I) :



in which R<sup>1</sup> represents hydrogen, substituted or unsubstituted C<sub>1-6</sub> alkyl, or substituted or unsubstituted C<sub>1-7</sub> alkanoyl; R<sup>2</sup> represents hydrogen, substituted or unsubstituted C<sub>1-6</sub> alkyl, substituted or unsubstituted C<sub>2-6</sub> alkenyl, substituted or unsubstituted C<sub>3-8</sub> cycloalkyl, C<sub>7-12</sub> bicycloalkyl or C<sub>7-12</sub> tricycloalkyl, substituted or unsubstituted aryl, substituted or unsubstituted C<sub>7-15</sub> aralkyl, or a substituted or unsubstituted heterocyclic group; R<sup>3</sup> represents a substituted or unsubstituted heterocyclic group; X represents a single bond, O, S, S(O), S(O)<sub>2</sub>, or NR<sup>4</sup> (in which R<sup>4</sup> represents hydrogen, or substituted or unsubstituted C<sub>1-6</sub> alkyl; or R<sup>2</sup> and NR<sup>4</sup> are combined to form a substituted or unsubstituted 4 to 6-membered saturated heterocyclic group); and A represents N; with 1 to 3 substituents being present in the substituted moieties, independently chosen from: C<sub>1-6</sub> alkyl, hydroxy, hydroxy-C<sub>1-6</sub> alkyl, halogeno-C<sub>1-6</sub> alkyl, C<sub>1-6</sub> alkoxy, C<sub>1-6</sub> alkoxy-carbonyl, C<sub>1-6</sub> alkylthio, C<sub>1-6</sub> alkylsulfinyl, C<sub>1-6</sub> alkylsulfonyl, aryloxy, C<sub>7-15</sub> aralkyloxy, halogeno-aryloxy, halogeno-C<sub>7-15</sub> aralkyloxy, carboxy, carbamoyl, C<sub>1-7</sub> alkanoyl, aroyl, aryl, halogen, nitro, amino, cyano, or trifluoromethyl for the preparation of a pharmaceutical composition which is useful for treating depression.

#### Patentansprüche

1. Verwendung eines Triazinderivats oder eines pharmazeutisch verträglichen Salzes davon mit der folgenden Formel (I):



in der R¹ ein Wasserstoffatom, ein substituierter oder unsubstituierter C<sub>1-6</sub>-Alkyl- oder ein substituierter oder unsubstituierter C<sub>1-7</sub>-Alkanoylrest ist;

R² ein Wasserstoffatom, ein substituierter oder unsubstituierter C<sub>1-6</sub>-Alkyl-, ein substituierter oder unsubstituierter C<sub>2-6</sub>-Alkenyl-, ein substituierter oder unsubstituierter C<sub>3-8</sub>-Cycloalkyl-, C<sub>7-12</sub>-Bicycloalkyl- oder C<sub>7-12</sub>-Tricycloalkyl-, ein substituierter oder unsubstituierter Aryl-, ein substituierter oder unsubstituierter C<sub>7-15</sub>-Arylalkyl- oder ein substituierter oder unsubstituierter heterocyclischer Rest ist;

R³ ein substituierter oder unsubstituierter heterocyclischer Rest ist;

X eine Einfachbindung, O, S, S(O), S(O)<sub>2</sub> oder NR⁴ ist (wobei R⁴ für ein Wasserstoffatom oder einen substituierten oder unsubstituierten C<sub>1-6</sub>-Alkylrest steht oder R² und NR⁴ zusammen einen substituierten oder unsubstituierten 4- bis 6-gliedrigen gesättigten heterocyclischen Rest bilden);

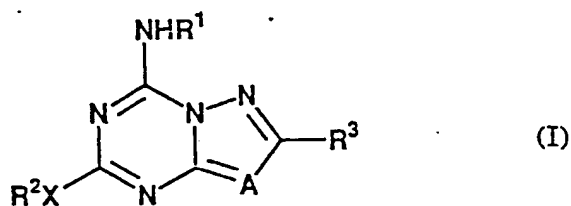
A ein Stickstoffatom ist;

mit 1 bis 3 Substituenten als Bestandteil der substituierten Einheiten, die unabhängig ausgewählt werden können aus: C<sub>1-6</sub>-Alkyl-, Hydroxy-, Hydroxy-C<sub>1-6</sub>-alkyl-, Halogen-C<sub>1-6</sub>-alkyl-, C<sub>1-6</sub>-Alkoxy-, C<sub>1-6</sub>-Alkoxy-carbonyl-, C<sub>1-6</sub>-Alkylthio-, C<sub>1-6</sub>-Alkylsulfinyl-, C<sub>1-6</sub>-Alkylsulfonyl-, Aryloxy-, C<sub>7-15</sub>-Aryloxy-, Halogen-aryloxy-, Halogen-C<sub>7-15</sub>-aryloxy-, Carboxyl-, Carbamoyl-, C<sub>1-7</sub>-Alkanoyl-, Aryl-, Aryl-, Halogen-, Nitro-, Amino-, Cyano- oder Trifluormethyl-Gruppen;

zur Herstellung eines Arzneimittels, das für die Behandlung von Depressionen verwendbar ist.

# Revendications

1. Emploi d'un dérivé de triazine ou d'un sel, admissible en pharmacie, d'un tel dérivé, représenté par la formule (I) suivante :



dans laquelle

R¹ représente un atome d'hydrogène, un groupe alkyle en C<sub>1-6</sub> substitué ou non, ou un groupe alcanoyle en C<sub>1-7</sub> substitué ou non ;

R² représente un atome d'hydrogène, un groupe alkyle en C<sub>1-6</sub> substitué ou non, un groupe alcényle en C<sub>2-6</sub> substitué ou non, un groupe cycloalkyle en C<sub>3-8</sub>, bicycloalkyle en C<sub>7-12</sub> ou tricycloalkyle en C<sub>7-12</sub>, substitué ou non, un groupe aryle substitué ou non, un groupe aralkyle en C<sub>7-15</sub> substitué ou non, ou un groupe hétérocyclique substitué ou non ;

R³ représente un groupe hétérocyclique substitué ou non ;

X représente une liaison simple ou un chaînon -O-, -S-, -S(O)-, -S(O)<sub>2</sub>- ou -NR⁴- où R⁴ représente un atome d'hydrogène ou un groupe alkyle en C<sub>1-6</sub> substitué ou non, ou bien R² et NR⁴ constituent ensemble un groupe

hétérocyclique saturé de 4 à 6 chaînons, substitué ou non ;  
et A représente un atome d'azote N ;

les groupes substitués portant de 1 à 3 substituants, indépendamment choisis parmi les atomes d'halogène et les groupes alkyle en C<sub>1-6</sub>, hydroxy, hydroxyalkyle en C<sub>1-6</sub>, halogénoalkyle en C<sub>1-6</sub>, alcoxy en C<sub>1-6</sub>, (alcoxy en C<sub>1-6</sub>) carbonyle, alkylthio en C<sub>1-6</sub>, alkylsulfinyle en C<sub>1-6</sub>, alkylsulfonyl en C<sub>1-6</sub>, aryloxy, aralkyloxy en C<sub>7-15</sub>, halogénoaryloxy, halogénoaralkyloxy en C<sub>7-15</sub>, carboxy, carbamoyl, alcanoyl en C<sub>1-7</sub>, aroyl, aryl, nitro, amino, cyano et trifluorométhyle ;

pour préparer une composition pharmaceutique utilisable dans le traitement d'une dépression nerveuse.

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**